IN2106 Practical Course:
Shape Reconstruction and Matching in Computer Vision

Preparation Meeting, 08.02.2023
start at 14:00.
00.08.059

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Structure

Lecture Part:
lectures in the initial weeks with programming assignments

Project Part:
working on a research project in group
Regular meetings with supervisors

Outcome:
give a talk and write a scientific report

Followed by Q&A (no further exams)
Lectures

• Masters practical course (prerequisites see later)
• 3-4 video lectures with face-to-face Q&A
  Wednesdays, 14:00-15:30 (starting from 19.04.2023 on)
• Programming assignments
• Topics: shape operators, distances, shape matching, reconstruction, manifolds
• Data modalities: images, point clouds, set, graphs etc.

Goal: You will know the necessary theories and background knowledges to start your projects.
Projects

• Research oriented projects
• Dynamic research goals
• Projects assignments to be done after the lecture part
• Working on a research project in group of max. 2 persons
• Regular 1-on-1 meeting with supervisors for updates and resolving issues [offline/online]
• Computation resources via ssh
• Weekly written summary of the progress before your 1-on-1 meeting

• Projects specifics will be decided later
• However, you can submit project proposals before the new semester and it may be considered (sample projects see later)
Evaluation Criteria

A weighted combination of:
• Homework assignments
• Project code and results
• Weekly and final reports
• Presentation and Q&A
Prerequisites

• Proficiency in python (or matlab)
• Familiar with version control (git)
• Comfortable with DL frameworks (pytorch, pyg etc.)
• Good knowledge of basic mathematics, linear algebra, probability, numerics, analysis etc.
• Participation in at least one of the offered deep learning lectures/labs, eg. I2DL, ADL4CV, IN2349 ...
• Or participation in at least one of the Multi-View Geometry lectures/labs, eg. MVG, VISNAV, IN2293 ...

• We may consider other courses offered outside of TUM if the content matches. Please highlight them in your application.
Application

• Assignment to the course via the matching system: https://matching.in.tum.de.
  (select your preference of the lab course on the system.)
• Application documents to be sent separately to us:
  Send your CV and Transcripts by 22.02.2023 to srmcv-ss23@vision.in.tum.de
  Please see the email format on the next slide
• We only consider the candidates who applied to the matching system AND sent their application documents
Application Email Format

In order to easily evaluate your profile for matching, we ask you to follow the format below:

Subject: Application [Your Matriculation Number]
In the body please give at least the following details:

- Matriculation #:
- Name:
- Name of Degree:
- Masters Semester #:
- Average Grade:
  - Bachelor:
  - Master (For the previous semester, if available)
- List of Relevant courses taken with grade

Please remember to also attach your CV and transcripts (Bachelor + Master).
Feel free to share any additional documents, information (eg. link to git, past research projects) that could support your application.
Optional: If you also have a project proposal fit into the lab course, please briefly describe.
Projects Samples

- Non-isometric shape correspondences
- Shape interpolation

Projects Samples

• Functional Correspondences

Projects Samples

• Descriptor learning

Halimi et al. Unsupervised Learning of Dense Shape Correspondence: https://arxiv.org/abs/1812.02415

8th Feb, 2023
Practical Course: Shape Reconstruction and Matching in Computer Vision
Projects Samples

• Partial shapes correspondences

Projects Samples

- Correspondences in shape collection

Projects Samples

• Point clouds registration

Huang et al. Synorim: https://arxiv.org/abs/2111.12878
Projects Samples

- Geodesic distances computation

Projects Samples

- Asymmetric Geodesic distances computation
- Extension to Finsler manifolds

Yang F. et al., Geodesic via Asymmetric Heat Diffusion Based on Finsler Metric
https://www.ceremade.dauphine.fr/~cohen/mypapers/FangYangACCV18-0788
Projects Samples

- Shape reconstruction by deforming the unit sphere to the desired shape
- Uses only a set of color images from various viewpoints as input

Projects Samples

- Single View 3D reconstruction using a Neural depth map

Any Questions?

Website: https://vision.in.tum.de/teaching/ss2023/srmcv

Email: srmcv-ss23@vision.in.tum.de
Appendix
Presentation, Q&A

- 30 minutes talk + Q&A (~15 min)
- number your slides
- use visualizations instead of full text
- reference the original author and conference/journal name
- use your template of choice

Recommended structure
1. Introduction of the problem
2. Approach
3. Results (if any)
4. Summary
Technical Report

- Overview and main contributions of the assigned topic
- The report is due 1 week after the oral exam
- Address the open questions left from the Q&A session
- 6-10 pages
- Use your text editor of choice if you must but keep the style similar to the template